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DESCRIPTION

TRANSFER DEVICE

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Technical Field

The present invention relates to a transfer device, which can transfer objects such as cars in vertical and horizontal directions.

Background Art

Conventionally, various transfer devices have been proposed, which transfer objects such as cars in vertical and horizontal directions. To give one example, there is a transfer device disclosed in Examined Patent Publication No. 7-86283. In the case of the transfer device disclosed in the above Publication, in a multistory parking space, a rotary tower extends upwardly from a carriage, and then, a pallet is lifted up and down in the rotary tower. Therefore, it is possible to transfer a car in a vertical direction in a state that the car is placed on the pallet. Further, the rotary tower is supported by the carriage at the bottom end of the rotary tower, and is driven by a driving motor, and thus, is rotated. Therefore, the pallet and the car are rotated integrally with the rotary tower, and thereby, it is possible to change the direction of the pallet and the

car, and to transfer the car in the horizontal direction, and thus, to carry it.

By the way, in the case of the transfer device disclosed in the above Publication, a plurality of car parking positions is provided over plural floors, and the car is transferred to each parking position. In this case, in order to carry the car in the parking position, when lifting up and down the pallet in the rotary tower, the pallet is lifted up and down to the uppermost floor and the lowermost floor, and the car must be transferred in the vertical direction; as a result, the transfer stroke becomes large. For this reason, the rotary tower must be made considerably long. Apart from the case where the rotary tower is short, in the case where the rotary tower is longer, it is difficult to support and rotate the longer rotary tower at the bottom end of the rotary tower. More specifically, not only the entire load of the rotary tower is applied to the bottom end thereof, but also a large twisting moment is generated by inertia between the top end of the rotary tower and the bottom end thereof. For this reason, the rotary tower is required to improve its rigidity (toughness), and in addition, the weight of the rotary tower inevitably increases. As a result, in order to securely support and smoothly rotate the rotary tower at the bottom end of the rotary tower, its support and

guide mechanism needs to have a high strength; for this reason, the cost increases.

Further, in the case of the transfer device disclosed in the above Publication, the rotary tower is provided at the lower side of a car carry in-and-out floor, and the car is carried in and out at the stroke top end in the vertical direction; in this case, there is no installation system other than above. In the transfer device disclosed in the above Publication, the rotary tower is rotated in a state of being supported at its bottom end. For this reason, it is impossible to provide the rotary tower at the upper side of the car carry in-and-out floor, and to carry in and out the car at the stroke bottom end in the vertical direction.

Disclosure of the Invention

The present invention has been made in view of the above problem. Accordingly, an object of the present invention is to provide a transfer device, which can transfer objects such as cars in vertical and horizontal directions. More specifically, an object of the present invention is to carry in and out the objects at the stroke bottom end of a vertical direction without causing a structural problem while carrying in and out the objects at the stroke top end thereof even if a stroke in the

vertical direction is large, and to freely select the installation system.

In order to achieve the above object, according to one aspect of the present invention, a horizontal rail, a carriage, a vertical column and a table are mutually combined, and the carriage runs along the horizontal rail. The vertical column is connected rigidly to the carriage, and is extended upwardly and downwardly. The table has a stroke capable of moving above and below the carriage, and is lifted up and down along the vertical column. Further, a drivingly running mechanism is incorporated into the carriage, and a drivingly lifting mechanism is incorporated into the vertical column or table. The carriage is run by the drivingly running mechanism, and the table is lifted up and down by the drivingly lifting mechanism. By doing so, it is possible to transfer the object in vertical and horizontal directions in a state that the object is placed on the table.

Further, according to the present invention, the vertical column is supported by the carriage and the horizontal rail at the intermediate position of the vertical column in the lengthwise direction, and not the bottom end thereof, and the carriage runs along the horizontal rail. Therefore, neither great twisting moment nor bending moment is generated by inertia. At

the plurality of height positions, the carriage and the horizontal rail are provided, and thereby, the entirety of weight is shared with the carriage and the horizontal rail. As a result, even if the vertical column is longer, it is possible to securely and smoothly support and move the longer vertical column. In addition, the table has a large stroke, and is lifted up and down without disturbance regardless of the installation position of the carriage and the horizontal rail.

Further, the object can be carried in and out at the stroke bottom end of the vertical direction, and can be carried in and out at the stroke top end thereof. As a result, on the up-and-down both sides of the carry in-and-out floor, it is possible to carry in and out the object at the floor above the carry in-and-out floor, and to carry in and out the object at the floor below the carry in-and-out floor. In addition, the vertical column may be provided at only upper side of the carry in-and-out floor so that the object can be carried in and out at the floor above the carry in-and-out floor. Conversely, the vertical column may be provided at only lower side of the carry in-and-out floor so that the object can be carried in and out at the floor below the carry in-and-out floor. Accordingly, the installation system can be freely selected, and a desired object can be

achieved.

Further, according to the present invention, a ring-like rail is used as the horizontal rail, and is arranged along the horizontal plane, an outer frame carriage forming an internal space is used as the carriage, and is supported to the ring-like rail at a plurality of portions of the carriage. Further, a plurality of vertical columns is arranged in the ring-like rail along an inner periphery of the carriage, and the vertical column and the carriage are connected rigidly to each other. The table is arranged between the vertical columns, and is passed through the internal space of the carriage so that the table is lifted up and down along the vertical columns, and the carriage is run and rotated along the ring-like rail.

Further, according to the present invention, the plurality of carriages is combined with the plurality of horizontal rails, and the horizontal rails are vertically arranged in parallel at a predetermined interval so that the carriage is supported to the horizontal rail. The vertical column is connected rigidly to the carriage at a height position of the horizontal rail. Further, a plurality of object carry-in positions is provided around the horizontal rail throughout plural floors so that the objects are

transferred to and carried in the carry-in position.

Further, according to the present invention, up-and-down both sides of an object carry in-and-out floor are provided with the carriage, the horizontal rail, the vertical column and the table.

In order to achieve the above object, according to another aspect of the present invention, a pair of linear rails is used as the horizontal rail, and is horizontally arranged in parallel at a predetermined interval. An outer frame carriage forming an internal space is used as the carriage, and is arranged between the linear rails so that the carriage is supported to the linear rail. Further, a plurality of vertical columns is arranged between the linear rails along an inner periphery of the carriage, and the vertical column and the carriage are connected rigidly to each other. The table is arranged between the vertical columns, and is passed through the internal space of the carriage so that the table is lifted up and down along the vertical columns, and thereby, the carriage may be run and moved along the linear rail.

Further, according to the present invention, the plurality of carriages is combined with the plurality of horizontal rails, and the horizontal rails are vertically arranged in parallel at a predetermined interval so that the carriage is supported to the

horizontal rail. The vertical column is connected rigidly to the carriage at a height position of the horizontal rail. Further, a plurality of object carry-in positions is provided around the horizontal rail throughout plural floors on both sides of a two-dimensional transfer path in vertical and horizontal directions of the objects so that the objects are transferred to and carried in the carry-in position.

Further, according to the present invention, up-and-down both sides of an object carry in-and-out floor are provided with the carriage, the horizontal rail, the vertical column and the table.

Brief Description of the Drawings

Fig. 1 is a perspective view showing a transfer device according to one embodiment of the present invention;

Fig. 2 is a top plan view showing a positional relation between a vertical column and a table shown in Fig. 1;

Fig. 3 is a partially enlarged transverse sectional view showing a carriage, the vertical column and the table shown in Fig. 1;

Fig. 4 is a longitudinally sectional view showing the table shown in Fig. 3;

Fig. 5 is a longitudinally sectional view showing the carriage and a horizontal rail shown in Fig. 3;

Fig. 6 is a side view showing the whole configuration of the transfer device shown in Fig. 1;

Fig. 7 is a perspective view showing a transfer device according to another embodiment of the present invention;

Fig. 8 is a side view showing the whole configuration of the transfer device shown in Fig. 7;

Fig. 9 is a top plan view showing a relation between a carry in-and-out floor and a parking position shown in Fig. 8; and

Fig. 10 is a top plan view showing another embodiment of the present invention.

Best Mode for Carrying out the Invention

Embodiments of the present invention will be described below with reference to the accompanying drawings.

Fig. 1 shows a transfer device for a car 1 in a multistory parking space. The transfer device has a carriage 2, which runs along a horizontal rail 3. The transfer device is a type of rotation, and a ring-like rail extending like ring is used as the horizontal rail 3. The ring-like rail 3 is arranged along the horizontal plane, and then, mounted and supported to a plurality of support members 4. Further, an outer frame forming an internal space 5 is used as the carriage 2, and the

carriage 2 is supported to the ring-like rail 3 at plural portions of the carriage 2. For example, as shown in Fig. 3, the carriage 2 has an outer frame ring, and forms the internal space 5, and a diameter of the internal space corresponds to that of the ring-like rail 3. Further, the carriage 2 is provided with wheels 6 at its plural portions. As shown in Fig. 5, the ring is proved with a segment at its outer side so that the ring and the segment are mutually connected and fixed. Each wheel 6 is interposed between the ring and the segment so as to be mounted to the ring and the segment, and is engaged with into the ring-like rail 3, and thereby, the carriage 2 is supported to the wheel 6 and the ring-like rail 3. Therefore, each wheel 6 is rolled along the ring-like rail 3, and thereby, the carriage 2 can be guided by each wheel 6. By doing so, the carriage 2 can be run and rotated along the ring-like rail 3.

Further, the transfer device has a vertical column 7 and a table 8. The vertical column 7 is connected rigidly to the carriage 2, and is extended upwardly and downwardly. The table 8 is used for placing the car 1 thereon, and has a stroke capable of moving above and below the carriage 2. Further, the table is lifted up and down along the vertical column 7. In this embodiment, in the ring-like rail 3, a plurality of vertical columns 7 is arranged

along the inner periphery of the carriage 2, and each vertical column 7 and the carriage 2 are connected rigidly to each other. For example, as shown in Fig. 2, four vertical columns 7 are installed along the inner periphery of the carriage 2, and are arranged around the center of the carriage 2 so as to form a rectangular shape. Each vertical column 7 and the carriage 2 are connected rigidly to each other by rigid connection means such as welding, bolt or the like.

On the other hand, the table 8 is interposed between the vertical columns 7, and is lifted up and down along each vertical column 7 passing through the internal space of the carriage 2. For example, as shown in Fig. 4, in an installation position of each vertical column 7, the vertical column 7 is provided with a vertical guide rail 9, and the table 8 is provided with a roller 10. Each roller 10 is engaged with the vertical guide rail 9. Therefore, each roller is rolled along the vertical guide rail 9, and thereby, the table 8 is guided by each roller 10. Further, the table 8 is passed through the internal space 5 of the carriage 2, and is lifted up and down along each vertical column 7.

Further, a drivingly running mechanism is incorporated into the carriage 2, and thereby, the carriage 2 can be run and rotated by the drivingly running mechanism.

For example, in the installation position of the specified wheel 6, a driving motor 11 is incorporated into the carriage 2, and is mounted to the ring of the carriage. The driving motor 11 and the wheel 6 are connected by a gear 12. In the manner described above, the drivingly running mechanism is constructed, and the wheel 6 is rotated by the driving motor 11, and thus, the carriage 2 can be run and rotated. Further, a drivingly lifting mechanism is incorporated into the vertical column 7 or the table 8, and the table 8 is lifted up and down by the drivingly lifting mechanism. For example, a driving motor 13 and a driving shaft 14 are incorporated and mounted into the table 8, and are connected by a gear. The driving shaft 14 is provided with a pinion 15. The drivingly lifting mechanism is composed of the above-mentioned driving motor 13, driving shaft 14 and pinion 15. Further, the vertical column 7 is provided with a vertical rack 16, and the pinion 15 is engaged with the vertical rack 16. A roller 17 is mounted to the table 8 on the side opposite to the pinion 15, and is engaged with the vertical rack 16. Therefore, the driving shaft 14 and the pinion 15 are rotated by the driving motor 13, and then, the table 8 is lifted up and down by the pinion 15 and the vertical rack 16. The roller 17 rolls along the vertical rack 16.

In this case, the driving motors 11 and 13 of the drivingly running mechanism and the drivingly lifting mechanism are connected with a remote controller. Therefore, these driving motors 11 and 13 are remotely controlled by the remote controller, so that these motors can be arbitrarily driven and stopped.

In this embodiment, a plurality of carriages 2 are combined with a plurality of horizontal rails 3, and each horizontal rail 3 is arranged in parallel and in the vertical direction at a predetermined interval. Further, each carriage 2 is supported to each horizontal rail 3, and each vertical column 7 is connected rigidly to each carriage 2 at the height position of each horizontal rail 3. Moreover, as shown in Fig. 6, a plurality of car parking position floors 18 is provided around each horizontal rail 3. The car parking position floor 18 is used for storing the car 1. The installation position of the carriage 2 and the horizontal rail 3 correspond to each floor. The carriage 2 and the horizontal rail 3 are provided for each floor or for several floors.

Further, in this embodiment, the carriage 2, the horizontal rail 3, the vertical column 7 and the table 8 are provided at the up-and-down both sides of a car carry in-and-out floor 19, and the up-and-down both side horizontal rail 3 and carriage 2 are arranged coaxially

with each other.

Therefore, in the transfer device, when carrying the car 1 in each parking position 18, first, the driving motor 13 is driven by the remote controller, and then, the table 8 is lifted up and down along the vertical column 7, and thereby, the table 8 is lifted up and down to the carry in-and-out floor 19. At the carry in-and-out floor 19, the car 1 is operated so that it can be placed on the table 8. Further, concurrently with the lift up-and-down of the table 8, or after the lift up-and-down thereof, the driving motor 11 is driven by the remote controller so that the carriage 2 is run and rotated along the ring-like rail 3. By doing so, the vertical column 7 and the table 8 are rotated integrally with the carriage 2, and thereby, it is possible to change the direction of the table 8. Therefore, the direction of the table 8 is arbitrarily adjusted, so that the car 1 can be readily placed on the table 8.

Incidentally, in the up-and-down both sides of the car carry in-and-out floor 19, the upside table 8 can place the car 1 thereon below the roller 10 and the pinion 15. On the other hand, the downside table 8 can place the car 1 thereon above the roller 10 and the pinion 15. Therefore, even if the vertical column 7, the vertical guide rail 9 and the vertical rack 16 do not extend crossing

the carry in-and-out floor 19, it is possible to lift up and down the table 8 to the carry in-and-out floor 19, and to place the car 1 at the carry in-and-out floor 19.

Thereafter, when the driving motor 13 is again driven so that the table 8 is lifted up and down along the vertical column 7, the car 1 placed on the table 8 is lifted up and down, and thereby, is transferred in the vertical direction so that the car 1 can be transferred to a specified floor. Further, concurrently with the lift up-and-down of the table 8 or after the lift up-and-down thereof, the driving motor 11 is again driven, and then, the carriage 2, the vertical column 7 and the table 8 are rotated along the ring-like rail 3. By doing so, the direction of the table 8 and the car 1 can be changed so as to correspond to a specified parking position 18. Thereafter, at the specified floor, the car 1 is properly operated, and then, is transferred in the horizontal direction so that it can be carried in the specified parking position 18. When carrying the car 1 in the specified parking position 18, the car 1 is transferred by a proper mechanism between the table 8 and the parking position 18, and thereafter, may be automatically carried therein.

After carrying the car 1, the table 8 is lifted up and down to the carry in-and-out floor 19, and then, is

properly rotated so as to newly place the next car 1 thereon. Thereafter, the table 8 and the car 1 are lifted up and down to a specified floor, and are properly rotated so as to carry the car 1 in another parking position 18. The above operation is repeated sequentially and alternately, and thereby, it is possible to transfer the car 1 to each parking position 18, and to carry it therein.

Conversely, in the case of taking the car 1 out of each parking position 18, the table 8 is lifted up and down to the specified floor. Further, concurrently with the lift up-and-down of the table 8 or after the lift up-and-down thereof, the table 8 is properly rotated. By doing so, the direction of the table 8 is changed so as to correspond to the specified parking position 18, and thereafter, at the specified floor, the car 1 is taken out of the specified parking position 18, and then, is placed on the table 8. Thereafter, the table 8 and the car 1 are lifted up and down to the carry in-and-out floor 19, and then, the car 1 is properly operated so as to carry out of the specified parking position at the carry in-and-out floor 19. Further, concurrently with the lift up-and-down of the table 8 or after the lift up-and-down thereof, the table 8 and the car 1 are properly rotated. By doing so, the direction of the table 8 and the car 1 is changed so as to correspond to the specified parking

position 18, and thereafter, the car 1 can be readily carried out of the specified parking position 18. Thereafter, the same process as above is repeated sequentially and alternately, and thereby, it is possible to carry the car 1 out of each parking position 18.

In this embodiment, the up-and-down both sides of the carry in-and-out floor 19 are individually provided with the carriage 2, horizontal rail 3, vertical column 7 and table 8. At the upside floor of the carry in-and-out floor 19, the table 8 is lifted up and down, and then, is rotated so that the car 1 can be carried in or carried out. Concurrently, the downside floor of the carry in-and-out floor 19, the table 8 is lifted up and down, and then, is rotated so that the car 1 can be carried in or carried out. Further, up-and-down both side horizontal rails 3 and carriages 2 are arranged coaxially with each other; therefore, it is possible to alternately lift up and down the up-and-down both side table 8 to the carry in-and-out floor 19, and to effectively carry in and out the car 1 at the same position as the carry in-and-out floor 19.

Therefore, in the case of this transfer device, in the multistory parking space including a plurality of car parking positions 18 throughout plural floors, the table 8 is lifted up and down to the uppermost and lowermost

floors, and then, the car 1 needs to be transferred in the vertical direction. Thus, the stroke is large, and there is a need of using the vertical column 7 having a considerable length; however, there is no problem in the transfer device. The vertical column 7 is connected rigidly to the carriage 2, and is extended upwardly and downwardly. As a result, unlike the rotary tower disclosed in the above Examined Patent Publication No. 7-86283, the vertical column 7 is supported by the carriage 2 and the horizontal rail 3 at the intermediate position of the lengthwise direction, and not the bottom end of the vertical column 7. Further, the carriage is run and rotated along the horizontal rail 3. Therefore, no great twisting moment is generated by inertia. At the plurality of height positions, the carriage 2 and the horizontal rail 3 are provided so as to support and rotate the vertical column 7, and thereby, the entirety of weight is shared with each carriage 2 and horizontal rail 3. As a result, even if the vertical column 7 is longer, it is possible to securely and smoothly support and rotate the longer vertical column 7.

On the other hand, the table 8 has the stroke capable of moving above and below the carriage 2, and is lifted up and down along the vertical column 7. Therefore, the table 8 has a large stroke, and can be lifted up and down

to the uppermost and lowermost floors, regardless of the installation position of the carriage 2 and the horizontal rail 3.

Further, in the transfer device, the vertical column 7 is supported and rotated at the intermediate position of the lengthwise direction of the vertical column 7. Thus, it is possible to carry in and out the car 1 at the stroke bottom end of the vertical direction, and to carry in and out the car 1 at the stroke top end thereof. As a result, the vertical column 7 is provided at the up-and-down both sides of the carry in-and-out floor 19, and thereby, it is possible to carry in and out the car 1 at the floor above the carry in-and-out floor 19, and to carry in and out the car 1 at the floor below the carry in-and-out floor 19. In addition, the vertical column 7 may be provided at only upper side of the carry in-and-out floor 19 so that the car 1 can be carried in and out at the floor above the carry in-and-out floor 19. Conversely, the vertical column 7 may be provided at only lower side of the carry in-and-out floor 19 so that the car 1 can be carried in and out at the floor below the carry in-and-out floor 19. As described above, the installation system can be freely selected.

Fig. 7 is a view showing another embodiment of the present invention. In this embodiment, a pair of linear

rails 20 and 20b is used as the horizontal rail. Further, these linear rails 20 and 20b are horizontally arranged in parallel with each other at a predetermined interval. Moreover, a frame having an internal space 22 is used as the carriage 21. These carriages 21 are arranged between the linear rails 20a and 20b, and are supported thereto. For example, a pair of saddles 23 is combined with a pair of connective members 24, and is arranged on the paired linear rails 20a and 20b. Further, both ends of each saddle 23 are connected by each connective member 24, and thereby, a carriage 21 is constructed. The carriage 21 thus constructed is formed into a predetermined rectangular shape having an internal space 22. Further, a wheel 25 is provided at a plurality of portions of each saddle 23, and is engaged with each of the linear rail 20a and 20b. The carriage 21 is supported by the wheel 25 and the linear rails 20a and 20b. Therefore, each wheel 25 is rolled along the linear rails 20a and 20b, and then, the carriage 21 is guided by the wheel 25. By doing so, the carriage 21 can be run and moved along the linear rails 20a and 20b.

A plurality of vertical columns 26 is arranged between the linear rails 20a and 29b along an inner periphery of the carriage 21, and each vertical column 26 and the carriage 21 are connected rigidly to each other.

For example, four vertical columns 26 are provided along the inner periphery of the carriage 21, and are arranged at four corners. Each vertical column 26 and the carriage 21 are connected rigidly to each other by rigid connection means such as welding, bolt or the like. Moreover, a table 27 is combined with these vertical columns 26 and the carriage 21, and is arranged between the vertical columns 26. Further, the table 27 is passed through the internal space 21 of the carriage 21, and is lifted up and down along the each vertical column 26. For example, in the same manner as the embodiment shown in Fig. 1, the vertical column 26 is provided with a vertical guide rail at the installation position of each vertical column 26, and the table 27 is provided with a roller. The roller is rolled along the vertical guide rail so that the table 27 is guided by each roller, and thereby, the table 27 is passed through the internal space 22 of the carriage 21, and then, is lifted up and down along the each vertical column 26.

Further, a drivingly running mechanism is incorporated into the carriage 21, and the carriage 21 is run and moved by the drivingly running mechanism. For example, in the installation position of a specified wheel 25, a driving motor 28 is incorporated into the carriage 21, and is mounted to the saddle 23, and the driving motor

28 and the wheel 25 are connected by a gear, and thereby, the drivingly running mechanism is constructed. Therefore, the wheel 25 is rotated by the driving motor 28 so that the carriage 21 can be run and moved. In addition, the driving motor 28 can be remotely controlled by the remote controller, like the embodiment shown in Fig. 1.

Further, a drivingly lifting mechanism is incorporated into the vertical column 26 or the table 27, and the table 27 is lifted up and down by the drivingly lifting mechanism. For example, like the embodiment shown in Fig. 1, a driving motor, a driving shaft, a gear and a pinion are incorporated and mounted into the table 27, and the vertical column 26 is provided with a vertical rack 29, which is engaged with the pinion. Thus, the table 27 is lifted up and down by the pinion and the vertical rack 29. In place of the above configuration, the driving motor and a chain are incorporated and mounted into the vertical column 26, and the chain is connected with the table 27. The drivingly lifting mechanism is constructed by the driving motor and the chain, and the chain may be driven by the driving motor so that the table 27 can be lifted up and down. In this case, the driving motor of the drivingly lifting mechanism can be remotely controlled by the remote controller.

Therefore, in the transfer device, the car 1 is placed

on the table 27, and thereafter, when the driving motor and the chain are driven by the remote controller, the table 27 is lifted up and down along the vertical column 26. By doing so, the car 1 is automatically lifted up and down by the table 27, and thus, can be transferred in the vertical direction. Further, the driving motor 28 is driven by the remote controller, and then, the carriage 21 is run and moved along the linear rails 20a and 20b, and thereby, the vertical column 26 and the table 27 are moved integrally with the carriage 21. Therefore, the car 1 is moved by the table 27, and can be transferred in the horizontal direction. In short, in the transfer device, a two-dimensional transfer path is formed by the vertical column 26 and the linear (horizontal) rails 20a and 20b; therefore, it is possible to transfer the car along the transfer path thus formed.

In this embodiment, a plurality of carriages 21 is combined with a plurality of horizontal rails 20a and 20b, and the horizontal rails 20a and 20b are vertically arranged in parallel at a predetermined interval. Further, the carriage 21 is supported to the horizontal rails 20a and 20b, and the vertical column 26 is connected rigidly to the carriage 21 at the height position of the horizontal rails 20a and 20b. As shown in Fig. 8 and Fig. 9, both sides of the two-dimensional transfer path of

the car 1 are provided with a plurality of car parking positions 30 including plural floors. The installation position of the carriage 21 and the horizontal rails 20a and 20b is as follows. More specifically, the carriage 21 and the horizontal rails 20a and 20b are provided for each floor or for several floors, and the installation position of these carriage 21 and the horizontal rails 20a and 20b correspond to the floor surface of each floor. Therefore, the car 1 can be transferred along the two-dimensional transfer path, and thereafter, can be carried in each parking position 30.

Further, in the same manner as the embodiment shown in Fig. 1, the carriage 21, horizontal rails 20a and 20b, vertical column 26 and table 27 are individually provided on the up-and-down both sides of a car carry-in-and-out floor 31. Therefore, the car 1 can be transferred at the floor above the carry-in-and-out floor 31, and carried therein or carried out thereof. Concurrently with the above operation, the car 1 can be transferred at the floor below the carry-in-and-out floor 31, and carried therein or carried out thereof. In addition, the predetermined position of the carry-in-and-out floor 31 is selected as a carry in-and-out position, and the table 27 on the up-and-down both sides is alternately moved and lifted up and down to the position so that the car 1 can be carried

in and out at the same position as the carry in-and-out floor 31.

Further, in the transfer device, the carriage 21, the vertical column 26 and the table 27 are provided on the up-and-down both sides of the car carry-in-and-out floor 31 by two pairs right and left, and are run and moved along the horizontal rails 20a and 20b. Therefore, the car 1 is placed on the left-side table 27 on the carry in-and-out position of the carry in-and-out floor 31, and then, is moved to the right side of the carry in-and-out position, and thereby, the car 1 is transferred and carried in by the left-side table 27. Concurrently with the above operation, the car 1 is transferred and carried in by the right-side table 27. Moreover, the car 1 is carried out of the parking position by the left-side table 27, and concurrently with the above operation, the car 1 is transferred and carried out thereof by the right-side table 27.

In the transfer device, the vertical column 26 is supported by the carriage 21 and the horizontal rails 20a and 20b at the intermediate position of the lengthwise direction of the vertical column 26, and not the bottom end thereof, and is run and moved along the horizontal rails 20a and 20b. Therefore, no great twisting moment is generated by inertia. At the plurality of height

positions, the carriage 21 and the horizontal rails 20a and 20b are provided so as to support and move the vertical column 26, and thereby, the entirety of weight is shared with each carriage 21 and horizontal rails 20a and 20b. As a result, even if the vertical column 26 is longer, it is possible to securely and smoothly support and move the longer vertical column 26.

On the other hand, the table 27 has the stroke capable of moving above and below the carriage 21, and is lifted up and down along the vertical column 26. Therefore, the table 27 has a large stroke, and can be lifted up and down without disturbance, regardless of the installation position of the carriage 21 and the horizontal rails 20a and 20b.

Further, in the transfer device, it is possible to carry in and out the car 1 at the stroke bottom end of the vertical direction and to carry in and out the car 1 at the stroke top end thereof. As a result, it is possible to carry in and out the car 1 at the floor above the carry in-and-out floor 31, and to carry in and out the car 1 at the floor below the carry in-and-out floor 31. In addition, the vertical column 26 may be provided at only upper side of the carry in-and-out floor 31 so that the car 1 can be carried in and out at the floor above the carry in-and-out floor 31. Conversely, the vertical

column 26 may be provided at only lower side of the carry in-and-out floor 31 so that the car 1 can be carried in and out at the floor below the carry in-and-out floor 31.

The above embodiment has described the case where the car 1 is transferred in the vertical and horizontal directions. The present invention is not limited to the car 1, and may be applicable to the case where other objects are transferred in the vertical and horizontal directions. For example, as shown in Fig. 10, in a construction site, one or tow endless rails is used as a horizontal rail 32, and is arranged along the horizontal plane, and further, a carriage 33 may be run and circulated along the endless rail 32. At the outer side of the endless rail 32, a vertical column 34 is connected rigidly to the carriage 33, and a table 35 is lift up and down along the vertical column 34. By doing so, it is possible to transfer construction materials in vertical and horizontal directions in a state that they are placed on the table 35.

In the embodiment shown in Fig. 10, the vertical column 34 is extended above and below the carriage 33 in the same manner as the above embodiment. The table 35 has a stroke capable of moving above and below the carriage 33, and is lifted up and down along the vertical

column 34 in the same manner as the above embodiment. Therefore, the vertical column 34 is supported by the carriage 33 and the horizontal rail 32 at the intermediate position of the lengthwise direction of the vertical column 34, and not the bottom end thereof, and is run and circulated along the horizontal rail 32. As a result, no great bending moment is generated by inertia. At the plurality of height positions, the carriage 33 and the horizontal rail 32 are provided so as to support and circulate the vertical column 34, and thereby, the entirety of weight is shared with each carriage 33 and the horizontal rail 32. Therefore, even if the vertical column 34 is longer, it is possible to securely and smoothly support and move the longer vertical column 34. Further, it is possible to carry in and out the construction materials at the stroke bottom end of the vertical direction, and to carry in and out the construction materials at the stroke top end thereof.

Industrial Applicability

The present invention is not limited to the multistory parking space transferring the car in the vertical and horizontal directions, and may be applicable to a material storage warehouse and multistory warehouse, which transfer construction materials, other various

components and objects.